

# Mark Scheme

## Sample Assessment Material

GCSE

GCSE in Mathematics Specification B  
Higher Tier

Unit 3: Number, Algebra, Geometry 2 (Calculator)

## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

*i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*

Comprehension and meaning is clear by using correct notation and labelling conventions.

*ii) select and use a form and style of writing appropriate to purpose and to complex subject matter*

Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

*iii) organise information clearly and coherently, using specialist vocabulary when appropriate.*

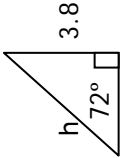
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

Guidance on the use of codes within this mark scheme
M1 - method mark
A1 - accuracy mark
B1 - working mark
C1 - communication mark
QWC - quality of written communication
oe - or equivalent
cao - correct answer only
ft - follow through
sc - special case

# Unit 3 Higher Tier: Number, Algebra, Geometry 2

5MB3H				
Question	Working	Answer	Mark	Additional Guidance
1. FE	$380 \div 200 = 1.9$ $350 \div 175 = 2$	Regular by 0.1p per gram	3	M1 for $380 \div 200 (= 1.9)$ or $200 \div 380 (= 0.526)$ M1 for $350 \div 175 (= 2)$ oe or $175 \div 350 (= 0.5)$ oe C1 for Regular with correct calculations
Total for Question: 3 marks				
2. (a)(i) (ii)		4.08	3	B1 for 5.6644 or 81.8535(2772...) or 76.1(8912772...) or 18.67 B1 for 4.08(0831694) B1 cao
Total for Question: 3 marks				
3.	$2(3x + 2x + 7) = 22$ <b>OR</b> $3x + 2x + 7 + x + x + 2x + x + 7 = 22$ $10x + 14 = 22$ $10x = 8$ $x = 0.8$ Area = $2.4 \times 8.6 - 1.6 \times 0.8$ <b>OR</b> $0.8 \times 08 + 2.4 \times 7.8$	19.36 cm <sup>2</sup>	5	M1 for attempt to find an expression of the perimeter A1 for $10x + 14 = 22$ A1 for $x = 0.8$ M1 for attempt to find area A1 for 19.36
Total for Question: 5 marks				
4. (a)		-3, -2, -1, 0, 1	2	B2 for -3, -2, -1, 0, 1 (B1 for -2, -1, 0, 1 or -2, -1, 0, 1, 2)
(b)		$-1 < x \leq 3$	2	B2 for $-1 < x \leq 3$ (B1 for $-1 \leq x \leq 3$ or $-1 < x < 3$ )
Total for Question: 4 marks				

5MB3H				
Question	Working	Answer	Mark	Additional Guidance
5. QWC (ii, iii)  FE	For 100 units: N Eastern = £30 Pacific = £20 East Anglian = £20  For 200 units: N Eastern = £30 Pacific = £40 East Anglian = £30 OR Graphs plotted correctly	Correct conclusion with justifying working	5	B1 for calculating 2 correct points for Pacific M1 for attempt find 2 correct points on East Anglian  A1 for two correct points on East Anglian  M1 for calculating a point that allows a comparison to be made between 100 and 200 units  C1 for correct conclusion QWC: Decision must be stated, and all comments should be clear and follow through from working out
Total for Question: 5 marks				
6.  FE	$2 \times (62 + 0.50 + 1)$ "127" $\times 1.15$	£146.05	3	M2 for attempt to find cost including VAT e.g. "127" $\times 1.15$  (M1 for VAT = "127" $\times 0.175$ or $\frac{15}{100} \times 127$ or $12.70 + 6.35$ )  A1 cao
(b)	$71.30 \div 1.15$	£62	2	M1 for $71.30 \div 1.15$ or $71.30 \div 115 \times 100$ A1 cao
(c)		1.02(173913)	2	M1 for $\div 1.15$ or $\times 1.175$ A1 for 1.02(173913)
Total for Question: 7 marks				
7.	$1189 \div 200$ or $891 \div 200$ = 5 and 4 or 20 squares $200^2 \div 2$ = $\sqrt{(200^2 \div 2)}$ = 141.4 Realising that another row of squares of side 141.4 fits or $891 \div 141.4$ = 5 squares	90	5	M1 for attempt to divide $1189 \div 200$ or $891 \div 200$ M1 for $200^2 \div 2$ M1 for $\sqrt{(200^2 \div 2)}$  M1 for realising that another row of squares of side 141.4 fits or $891 \div 141.4$  A1 cao for 90 triangles
Total for Question: 5 marks				

5MB3H				
Question	Working	Answer	Mark	Additional Guidance
8.  FE	 $\sin 72 = \frac{3.8}{h}$ $h = \frac{3.8}{\sin 72}$	4 m	4	M1 for drawing sketch of scenario showing all information M1 for $\sin 72 = \frac{3.8}{h}$ or for attempt at scale drawing M1 for $h = \frac{3.8}{\sin 72}$  C1 any ladder over 4.66 m long providing M3 earned  NB scale drawing attempt scores a maximum of 2 marks
Total for Question: 4 marks				
9.	(a)  $2 = 2 \times 3.14 \times \sqrt{\frac{l}{9.81}}$ $\sqrt{\frac{l}{9.81}} = \frac{2}{2 \times 3.14}$ $\frac{l}{9.81} = \left(\frac{2}{2 \times 3.14}\right)^2$ $l = 9.81 \times \left(\frac{2}{2 \times 3.14}\right)^2$	0.995	2	M1 for dividing 2 by $2 \times 3.14$ and squaring A1 for 0.994(96937) cao
(b)	$T^2 = 4\pi^2 \frac{l}{g}$ $\frac{T^2}{4\pi^2} = \frac{l}{g}$	$l = \frac{T^2 g}{4\pi^2}$	3	M1 for squaring both sides M1 for dividing by $4\pi^2$ or multiplying by $g$ A1 for $l = \frac{T^2 g}{4\pi^2}$ oe
Total for Question: 5 marks				

5MB3H					Total for Question: 4 marks	
Question	Working	Answer	Mark	Additional Guidance		
10.	$x(x + 3) = (x + 7)(x + 4)$	-3.5	4	M1 for multiplying through by LCD = $(x + 4)(x + 3)$ A1 for $x^2 + 3x = x^2 + 11x + 28$ B1 for $- 28 = 8$ A1 cao		
11.	(a) $78 - 65 = 13$ $\frac{DB}{\sin 65} = \frac{50}{\sin "13"}$ $DB = \frac{50}{\sin "13"} \times \sin 65$ (=201..) "201" $\times \sin 78$	197 m	6	B1 for $13^\circ$ M1 for $\frac{DB}{\sin 65} = \frac{50}{\sin "13"}$  M1 for $DB = \frac{50}{\sin "13"} \times \sin 65$  A1 for 201 – 201.5  M1 for "201" $\times \sin 78$  A1 for 196.6 – 197.1  OR B1 for $13^\circ$ M1 for $\frac{AD}{\sin 102} = \frac{50}{\sin "13"}$  M1 for $AD = \frac{50}{\sin "13"} \times \sin 102$ A1 for 217 – 217.42  M1 for "217" $\times \sin 65$  A1 for 196.6 – 197.1		
					Total for Question: 6 marks	

5MB3H				
Question	Working	Answer	Mark	Additional Guidance
12.	$15x + 10y = 55$ $4x - 10y = 40$  $19x = 95$ $x = 5$  $15 + 2y = 11$ $2y = -4$ $y = -2$	$x = 5$ $y = -2$	4	M1 for correct multiplication and use of correct operation to eliminate either $x$ or $y$ , condone one arithmetical error A1 for either $x = 5$ or $y = -2$ M1 (dep) for substitution of found variable into either equation A1 for correct value of 2 <sup>nd</sup> variable <b>OR</b> M1 Correct rearrangement of 1 equation and substitution into 2 <sup>nd</sup> equation A1 for either $x = 5$ or $y = -2$ M1 (dep) for substitution of found variable into either equation A1 for correct value of 2 <sup>nd</sup> variable <b>OR</b> M1 for one line drawn M1 for second line drawn A1 for $x = 5$ A1 for $y = -2$ (SC : If no method marks awarded, score B1 for one value correct)
Total for Question: 4 marks				
13.	$\frac{-2 \pm \sqrt{2^2 - 4 \times 3 \times -4}}{2 \times 3}$ $= \frac{-2 \pm \sqrt{52}}{6}$ <b>OR</b> $3\left(x + \frac{1}{3}\right)^2 - \frac{13}{3} = 0$ $\left(x + \frac{1}{3}\right)^2 = \frac{13}{9}$	0.869 -1.54	3	M1 for $\frac{-2 \pm \sqrt{2^2 - 4 \times 3 \times -4}}{2 \times 3}$ allow substitution of $c = \pm 4$ M1 for $\frac{-2 \pm \sqrt{52}}{6}$ A1 for 0.869 and -1.54 <b>OR</b> M1 for $3\left(x + \frac{1}{3}\right)^2 - \frac{13}{3} = 0$ M1 for $\left(x + \frac{1}{3}\right)^2 = \frac{13}{9}$ A1 for 0.869 and -1.54 <b>Trial and improvement:</b> M1 correct set of trials A1 for 0.869 and -1.54
Total for Question: 3 marks				

5MB3H				
Question	Working	Answer	Mark	Additional Guidance
14.  FE	$\frac{(29.95 \times 14.95 \times 7.95)^3}{\frac{4}{3} \pi (0.255)^3}$ $= \frac{3559.632375}{0.0694559011 \cdot 8}$	£462.25	6	B1 for using the least value of 1 dimension of the cuboid M1 for $29.95 \times 14.95 \times 7.95$ oe B1 for using greatest radius of sphere as $0.25\text{cm} + 0.005\text{ cm}$ M1 for dividing least volume of lead "3559.632375" by greatest volume of sphere "0.0694559"  A1 for 51250 or Selling price = £51.25 A1 for Profit = £1.25 cao
				Total for Question: 6 marks



5MB3H				
Question	Working	Answer	Mark	Additional Guidance
15. QWC (i, ii, iii)	Join AO and produce to P Mark equal angles in isosceles triangle AOC or AOB Mark angle COP as twice angle CAO or mark angle BOP as twice angle BAO Identify angle A as half angle BOC		4	M1 for Joining AO and producing to "P" M1 for marking equal angles in isosceles triangle AOC or AOB giving reason that triangles are isosceles because radii are equal  M1 for marking angle COP as twice angle CAO or marking Angle BOP as twice angle BAO giving reason that exterior angle of a triangle is equal to the interior and opposite angles o.e. QWC: Working should be logical and sequential in structure; following on from labelling the extended line A1 for Identifying angle A as half angle BOC if M3 awarded QWC: All labelling and angle notation should be consistent
Total for Question: 4 marks				
16.	$-6b - 6a + 12b$	$6b - 6a$	1	B1 cao
QWC (ii, iii)	$\vec{BC} = -6b - 6a + 12b = 6b - 6a$ $\vec{CY} = 4b - 4a$ $\vec{OX} = 12b - 3a$ $\vec{OY} = 12b + 4b - 4a = 16b - 4a$ $\vec{OX} : \vec{OY} = 3 : 4$		4	M1 for attempt to find $\vec{CY}$ or sight of $\frac{2}{3}(6b - 6a)$  M1 for attempt to find $\vec{OX}$ or sight of $12b - 3a$ M1 for attempt to find $\vec{OY}$ or sight of $12b + 4b - 4a$  A1 for $OX : OY = 3 : 4$ shows that OX and OY are co-linear QWC: labelling must be consistent and correct
Total for Question: 5 marks				
17.		$(1, 5)$ $(3, 2)$	2	B1 cao B1 cao
		Reflection in $x$ axis	1	B1 cao
Total for Question: 3 marks				

5MB3H				
Question	Working	Answer	Mark	Additional Guidance
18.	$\frac{120}{360} \times 2\pi \times 10.3 = 21.572$ $"21.572" \div 2\pi = 3.4333$ $\sqrt{(10.3^2 - 3.433^2)}$	9.71	4	<p>M1 for Length of arc = <math>\frac{120}{360} \times 2\pi \times 10.3</math></p> <p>M1 for Radius of circle = "21.572" <math>\div 2\pi</math></p> <p>M1 for <math>\sqrt{(10.3^2 - 3.433^2)}</math></p> <p>A1 cao</p>
Total for Question: 4 marks				

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